# More Motion Questions — A Hodge-Podge

1. A ball rolls up a hill at 10 m/s [up] and accelerates at $-3.0\ m/s^2$ [up]. What is its velocity after:

   a) 1.0 s  b) 3.0 s  c) 4.0 s

2. A ship travels at 30 km/h [N30°E] for 10 h, then at 20 km/h [W60°S] for 17 h. What is it's resultant displacement?

3. Galileo's experiments led to the discovery of the relationship $\vec{a} = \vec{g}\sin\theta$ where $g$ is equivalent to the acceleration due to gravity. A piece of drapery track 3.50 m long is used as a ramp for ball bearings. If we want the ball bearings to accelerate at $1.4\ m/s^2$, how high should the one end of the track be raised?

4. A car travelling at 40 km/h accelerates at $-2.3\ m/s^2$ for 2.70 s. How far has it travelled in that time? What is it's final velocity?

5. What is an object's final velocity if it accelerates at $2.0\ m/s^2$ for 2.30 s from a velocity of 50 km/h?

6. A falling piece of bird doo takes 0.30 s to pass a window that is 2.40 m high. From what height above the top of the window did the bird release its "present"? Don't get too pooped out on this one.

#7 This one's tough! Persons who free-fall will often reach terminal velocity → they can't fall any faster. Superwoman is hovering above the ground when a person without a parachute passes her with a terminal velocity of 140 km/h. If it takes her 1.90 s to realize the problem, at what rate must she accelerate to catch the person just before she hits the ground 1000 m below?

Ans.

1. 7 m/s, 1 m/s, −2 m/s
2. N40 km [S30°W]
3. 0.50 m
4. 22 m, 4.8 m/s
5. 19 m/s
6. 2.17 m
7. $3.53\ m/s^2$